

(12) **UK Patent Application** (19) **GB** (11) **2 232 285 A** (43) Date of A publication 05.12.1990

(21) Application No 9012136.9

(22) Date of filing 31.05.1990

(30) Priority data
 (31) 360772

(32) 02.06.1989

(33) US

(71) Applicant
Cubic Western Data

(Incorporated in the USA - California)

9333 Balboa Avenue, San Diego, California
 92138-5587, United States of America

(72) Inventors
Peter Y Lo
Raymond T F Chan

(74) Agent and/or Address for Service
Withers & Rogers
 4 Dyer's Buildings, Holborn, London, EC1N 2JT,
 United Kingdom

(51) INT CL⁴
G07B 15/02

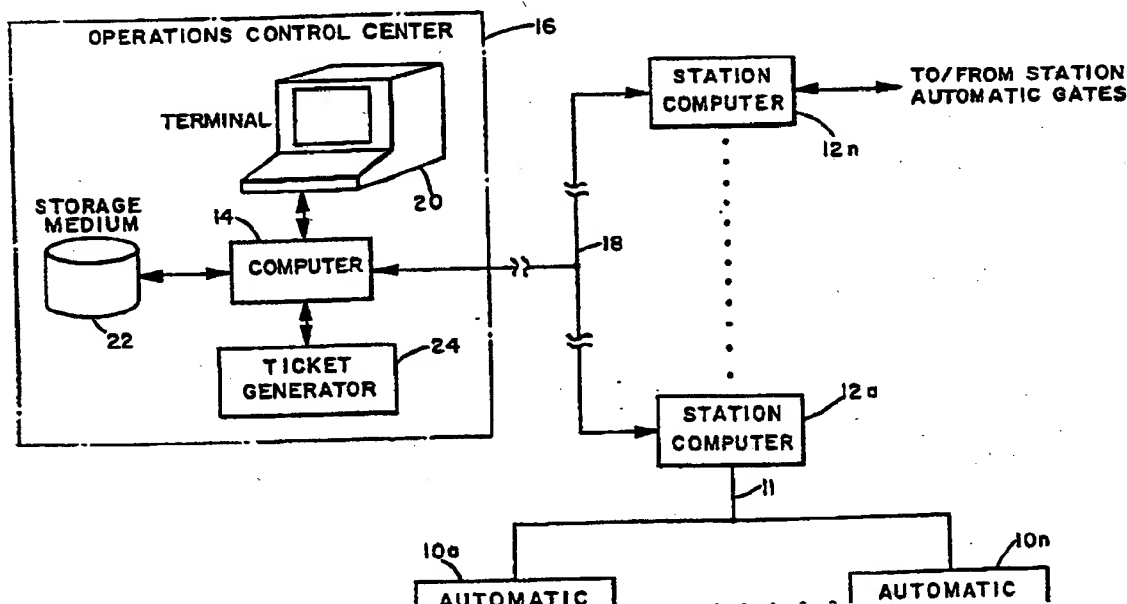
(52) UK CL (Edition K)
G4T TAE

(56) Documents cited
GB 1972180 A **EP 0163507 A** **EP 0036849 A**

(58) Field of search
 UK CL (Edition J) **G4T TAD TAE TAX**
 INT CL⁴ **G07B**

(54) Voucher usage tracking method and system

(57) A method and system for providing information related to the status of authorized vouchers where vouchers are presented by patrons of the system in exchange for services and/or goods, utilizes the recording, upon each voucher, authorization information in the form of an identification code and an initial credit value which are stored in a central storage medium (20). For each issued voucher involved in a transaction, respective transaction information is generated with the transaction information indicative of the nature of each transaction and a predetermined amount of credit to be deducted, the credit value recorded thereupon being modified in accordance with the transaction information, the transaction information also being stored in the central storage medium along with the identification code. At a predetermined time the stored voucher authorization and issued voucher transaction information is provided from the central storage medium and correlated by identification code. Authorized vouchers which are in credit are identified.



GB 2 232 285 A

-1-

TICKET USAGE TRACKING METHOD AND SYSTEM
BACKGROUND OF THE INVENTION

I. Technical Field

5 The present invention relates to information acquisition and processing systems. More specifically the present invention relates to a novel and improved method and system for acquiring and processing information related to the system in which pre-purchased vouchers are presented by patrons of the system in exchange for goods and/or services.

10 **II. Background Art**

 In recent years pre-purchased voucher systems have been implemented in society in many forms. One common application of the pre-purchased voucher system is to the public transportation industry. Many large metropolitan
15 cities throughout the world handle the fare collection for their public transportation systems by issuing pre-purchased vouchers. These pre-purchased vouchers serve as tickets and may be presented by patrons in exchange for transportation services. The vouchers, or tickets, will be good for a
20 certain period of time, number of rides or distance carried that is covered by the amount of money tendered at the initial purchase.

 The pre-purchased voucher system as applied to the mass public transportation industry provides several advantages.
25 The most significant of these advantages is convenience to the patron. The majority of people utilizing a mass public transportation system ride the system often and regularly. With pre-purchased vouchers or tickets available to this category of patrons, prepayment for system usage eliminates
30 the inconvenience and necessity of tendering fare each time

[ABJAPAT.E19]

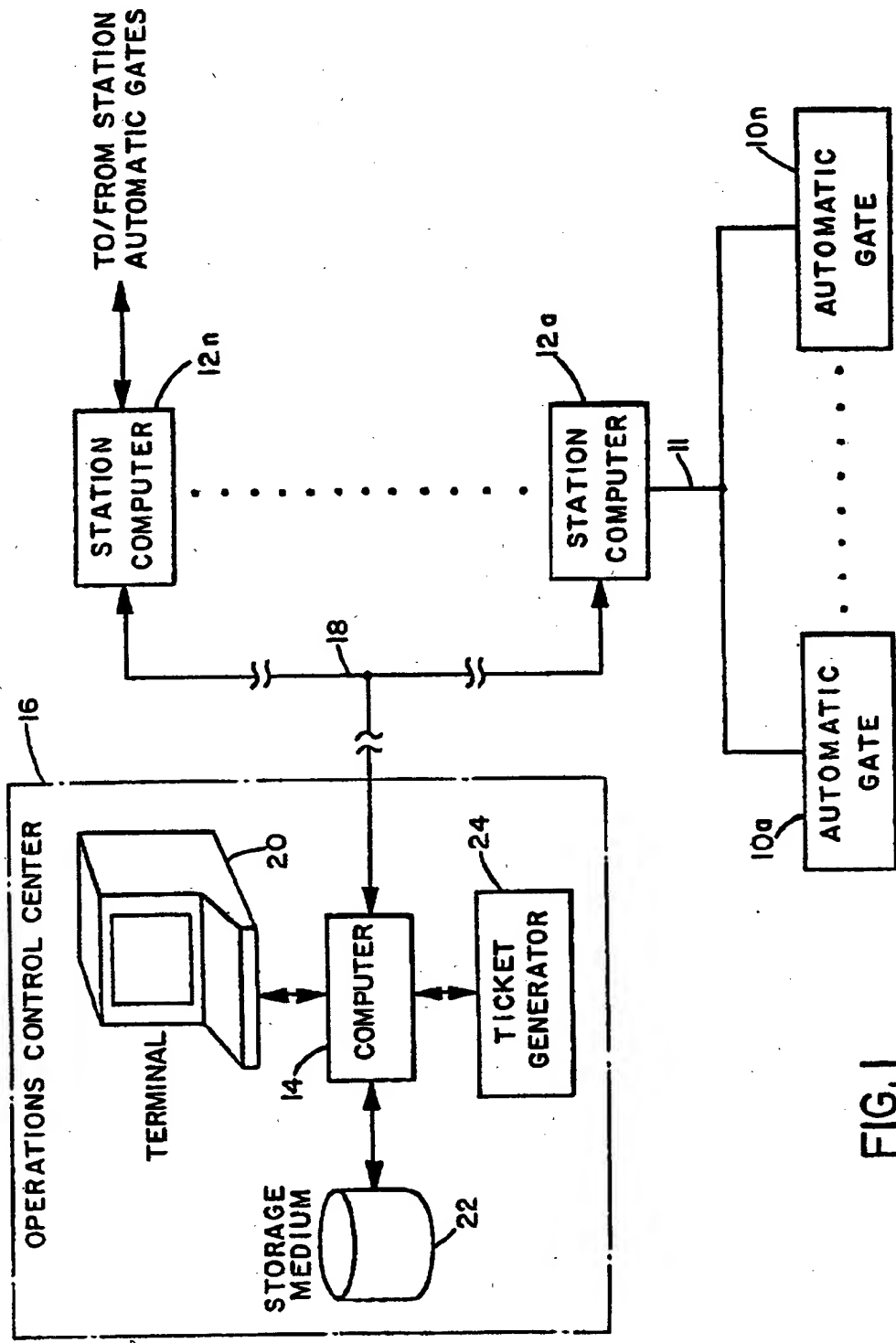


FIG. 1

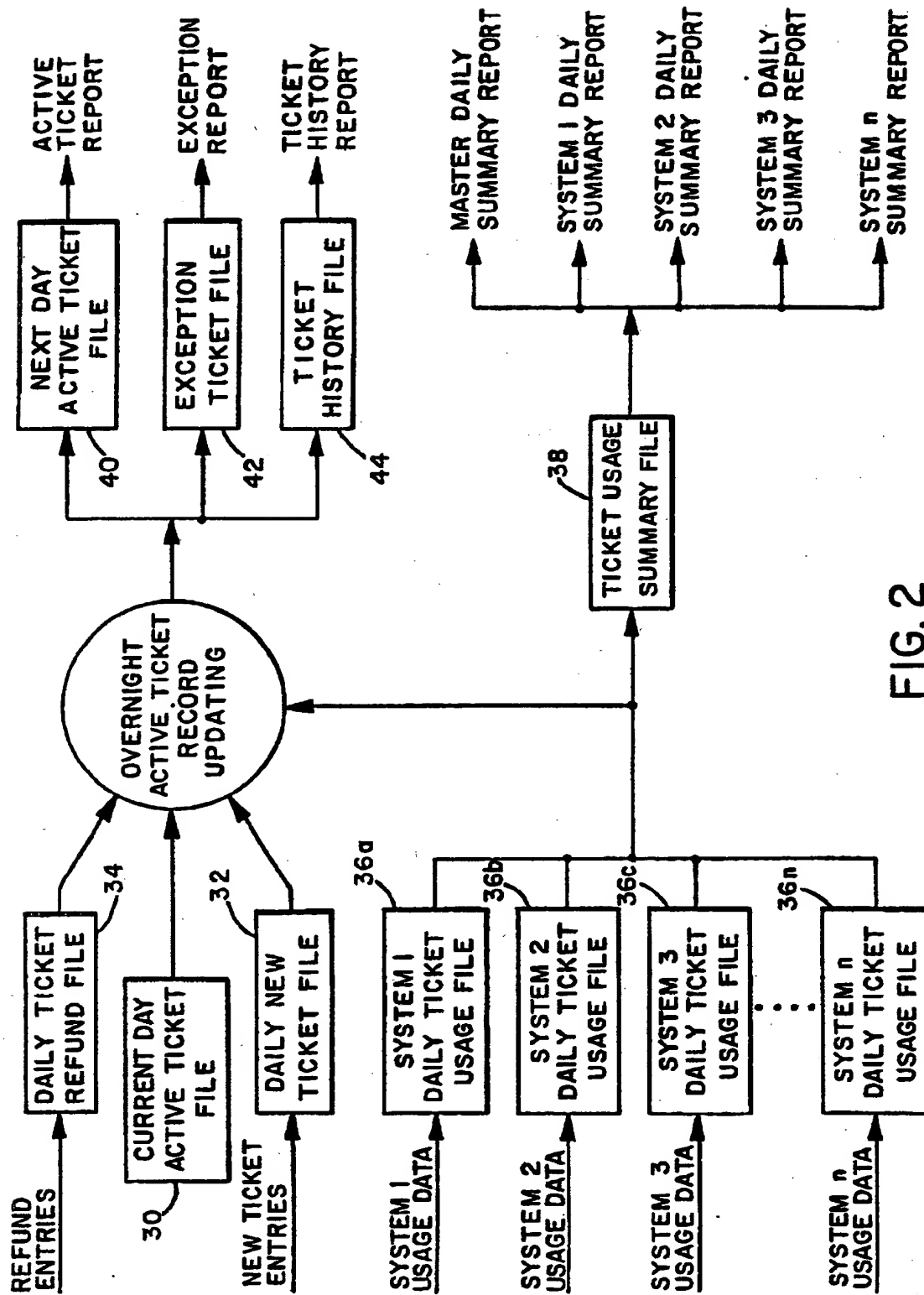


FIG. 2

-3-

will enable accurate revenue sharing between separate but coordinated transportation systems.

5 It is therefore the object of the present invention to provide a novel and improved method for enhancing the reliability of pre-purchased ticket fare collection systems.

It is another object of this invention to minimize the possibility of system patrons passing fraudulent tickets.

10 It is a further object of this invention to allow for the accurate reconstruction of damaged pre-purchased tickets which may still have value.

Yet another object of the present invention is to provide a method of determining transit system outstanding system usage or refund liability.

15 A further object of the present invention is to provide a method for accurately determining travel patterns of transportation system users.

20 It is yet another object of the present invention to provide a method for accounting, and revenue sharing amongst separate but coordinated transportation systems such as rapid transits, trains and buses.

SUMMARY OF THE INVENTION

25 The present invention relates to a method for the tracking of pre-purchased ticket usage in a mass public transportation system. Such a public transportation system handles the majority of its fare collections by issuing pre-purchased tickets to its patrons which are good for a number of trips on the transportation system. Each pre-purchased ticket has recorded thereupon identification information or
30 code unique to that ticket and a beginning credit value

[ABJAPAT.E19]

which is equal to the amount the patron paid for the ticket. The respective unique identification information and the beginning credit values of each issued pre-purchased ticket are stored in a central storage medium accessible by a transit system company. As the patrons present their pre-purchased tickets in exchange for transportation services, information related to patron activity and ticket usage is generated by the system. This usage information is also stored in the central storage medium accessible by the transit company.

Correlating and analyzing the initial ticket information and the usage information provides further valuable information to the transit company. Because the usage of each ticket is tracked and stored in a central storage medium along with the initial credit value corresponding to each ticket, the transit company can easily reconstruct faulty pre-purchased tickets which have been partially damaged but at least can be identified. Thus, patrons whose tickets fail before their full value has been redeemed can have their tickets refunded or be issued new tickets with an appropriate credit balance.

Recording initial ticket information and tracking ticket usage also allows the transit company to minimize the use of fraudulent pre-purchased tickets. The most common fraudulent ticket is one which is an exact duplicate of a legitimately issued ticket. Because the system records the initial value of the ticket as well as the usage of the ticket, ticket fraud can be identified when the usage of the ticket exceeds the initial value. Steps may then be taken to stop usage of the fraudulent ticket.

[ABJAPAT.E19]

The ticket usage tracking system of the present invention also allows the transit company to assess its outstanding liability. Because the initial purchase value for each ticket is recorded and the usage of each ticket is tracked, the system can calculate the total amount of credit value which exists on each ticket which has yet to be redeemed. This information is useful to the transit company in that they can accurately assess the amount of their cash intake which is theoretically due the patrons in the form of services or refunds.

Tracking patron activity and ticket usage also allows the transit company to accurately determine patron travel patterns. Travel pattern information can be extremely useful in many respects. With such information, the transit company can optimize vehicle and services assignments according to the needs of the patrons. The travel pattern information will also aid in the determination of optimum locations for advertisements. The activity and usage information also allows for accurate revenue sharing amongst the different transit stations and lines comprising the entire transit system, and amongst entirely separate but coordinated transportation systems. The travel pattern and the revenue derived from various types of travel patterns can be used to estimate accurately the increase in revenue in fare revision.

Applying the ticket usage tracking method of the present invention to various forms of public transportation, such as bus and train systems, allows for accurate revenue sharing amongst the separate systems and provides each separate system with the advantages previously discussed.

[ABJAPAT.E19]

BRIEF DESCRIPTION OF THE DRAWINGS

These and other features, and advantages of the present invention will become fully apparent from the detailed description set forth below when taken in conjunction with the drawings in which like reference characters correspond throughout and wherein:

Figure 1, is an illustration of an exemplary configuration of the present invention in which the major hardware components are identified as configured for use in a mass public rapid transit system; and

Figure 2, is a block diagram illustrating the various categories of information acquired by the ticket usage tracking system as implemented in a mass public transportation environment, and illustrating the manner in which these categories of information are correlated to produce further desired information.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The preferred embodiment of the ticket usage tracking method and system of the present invention is best illustrated as implemented in a mass public transportation environment. In this embodiment the preferred pre-purchased ticket used in the transportation system takes the form of a durable credit card sized card having magnetic storage medium on one side of the card for storing data typically in digital form. Figure 1 illustrates the basic hardware configuration for the ticket usage tracking system in the preferred embodiment.

The transportation system as illustrated in Figure 1

typically has at each transit station a series of automatic gates 10a-10n through which patrons of the transportation system must pass to access the transportation system vehicles. Gates 10a-10n are typically configured as the entrance and exit gates at a particular transit station. Gates 10a-10n are linked to a corresponding station computer 12a via dedicated communications bus 11. Station computers 12a-12n represent various station computers linked to automatic gates residing at corresponding transit stations in the system.

The transportation system utilizes a central computer 14 which is typically located at operations control center 16 for the convenience of transit system management. Computer 14 is typically comprises of two separate mainframe computers, one for communications purposes and another for data processing. Station computers 12a-12n communicate with computer 14 via a dedicated modem telephone line network 18.

Associated with the computer 14 is computer terminal 20, also located at operations control center 16, which provides operator interface, i.e. human interface, to the ticket usage tracking system. Terminal 20 typically includes a keyboard and video display to enable operator interface with computer 14. A printer (not shown) may be included at operations control center 16 and coupled to computer 14 to provide a hard copy of information.

Also located at operations control center 16 is central storage medium 22 which is coupled to computer 14. Storage medium 22 is typically a hard disk which provides for the storage of information gathered and analyzed by computer 14. Also included in the system, typically at operations control

center 16 is ticket generator 24. Ticket generator 24 produces tickets for purchase by the transportation system patrons. The produced tickets include information encoded thereupon as discussed later.

5 Figure 2 illustrates the categories of information acquired by the ticket usage tracking system as implemented in the preferred embodiment, and the manner in which these categories of information are correlated to produce further desired information.

10 CURRENT DAY ACTIVE TICKET file 30 contains information relative to the status of valid pre-purchased tickets currently in use as of the end of the previous day. For each ticket, CURRENT DAY ACTIVE TICKET file 30 contains information representing the ticket type, i.e. senior
15 citizen pass, express pass, regular pass, employee pass, and etc.; the date created; the ticket serial number; the value remaining on the ticket; and the station time the ticket was last used, time being recorded typically in fifteen minute intervals.

20 NEW TICKET file 32 contains information regarding each of the pre-purchased tickets created on a particular day. For each of the pre-purchased tickets created, the NEW TICKETS file contains information relative to the ticket type, the date created, the ticket serial number, and the
25 initial credit value.

DAILY TICKET REFUND file 34 contains information regarding pre-purchased tickets which were exchanged for a refund on a particular day. Such information may include ticket serial number and refund amount.

30 DAILY TICKET USAGE files 36a-36n represent the

-9-

individual DAILY TICKET USAGE files for a number of separate but coordinate public transportation systems. In Figure 2, four such DAILY TICKET USAGE files are specifically illustrated with each corresponding to a different public transportation system. However, it should be understood that greater or less such files may exist depending on the overall structure of the transit system.

Each DAILY TICKET USAGE file 36 contains information regarding each usage of each pre-purchased ticket on a particular day. For each usage of a particular pre-purchased ticket, the DAILY TICKET USAGE file contains the ticket type; the date created; the ticket serial number; value remaining on the ticket; value deducted for the particular transaction or journey; and the station, date and time the ticket was last used, time being typically kept in fifteen minute intervals. Other information relative to ticket usage may be included in this file, such as trip origin and destination, time of travel and etc. As illustrated, the DAILY TICKET USAGE files 36a-36n may be combined to create TICKET USAGE SUMMARY file 38. TICKET USAGE SUMMARY file 38 in essence contains the sum of information contained in the contributing files.

In the preferred embodiment, the ticket usage tracking system uses the information in files 30, 32, 34 and 36 for generating desired information in certain categories. The desired information is this contained in the files as described below.

NEXT DAY ACTIVE TICKET file 40 is generated by modifying the information of the CURRENT DAY ACTIVE TICKET file 30 with the information in NEW TICKET file 32, DAILY

[ABJAPAT.E19]

TICKET REFUND file 34, and each DAILY TICKET USAGE file 36a-36n. NEXT DAY ACTIVE TICKET file 40 contains information relative to each active pre-purchased ticket from CURRENT DAY ACTIVE TICKET file 30 by adding information relative to new tickets as found in NEW TICKET file 32 and then updated by information from DAILY TICKET USAGE files 36 and in particular information relative to the remaining value of active tickets which have been involved in transactions. NEXT DAY ACTIVE TICKET file 40 is also further by removing information relative to ticket refunds as indicated by DAILY TICKET REFUND file 34. The information of the NEXT DAY ACTIVE TICKET file is used the next day as the CURRENT DAY ACTIVE TICKET file.

EXCEPTIONS TICKET file 42 contains information regarding the tickets which are illegal for use in the transit system. The EXCEPTION TICKET file 42 is generated by correlating information in DAILY TICKET USAGE files 36 with information in NEXT DAY ACTIVE TICKET file 40. Tickets which are found in the DAILY TICKET USAGE files 96 that are not in the NEXT DAY ACTIVE TICKET file 40 are added to the EXCEPTION TICKET file. Also, when the NEXT DAY ACTIVE TICKET file 40 indicates that a particular ticket's remaining value has gone below zero that ticket is removed from the NEXT DAY ACTIVE TICKET file 40 and added to the exception file. For each ticket in the EXCEPTION TICKET file 42, the file contains the ticket type; the date created; the ticket serial number; the value remaining on the ticket; the station, date and time the ticket was last used, time being recorded in fifteen minute intervals; and the cause of the exception.

[ABJAPAT.E19]

-11-

TICKET HISTORY file 44 contains information regarding tickets removed from the ticket usage tracking system. The TICKET HISTORY file is generated by analyzing information in DAILY TICKET USAGE files 36 and DAILY TICKET REFUND file 34.

5 When a DAILY TICKET USAGE file 36 indicates a ticket has zero remaining value or expired, that ticket is removed from the system and added to the TICKET HISTORY file. Also, all tickets found in the daily ticket refund file are removed from the system and added to the TICKET HISTORY file. For
10 each ticket in the file, the TICKET HISTORY file contains the ticket type; the date the ticket was created; the ticket serial number; the value remaining on the ticket; the station, date and time the ticket was last used, again time being recorded in fifteen minute intervals; and the
15 cause of removal from the system.

There are several types of pre-purchased tickets available for use by the patron in the preferred embodiment of the present invention. These are standard stored value tickets, employee passes, value passes (special rate passes)
20 and monthly passes. Each of these types of pre-purchased tickets takes the form of a durable plastic card having at least one strip or portion of a magnetic recording medium on one side of the card for the storing of data typically in digital form. All pre-purchased tickets are initially
25 encoded at operations control center 16 (Figure 1) with their respective ticket type, date encoded, ticket serial number, and initial credit value by ticket generator 24 (Figure 1). Such data is also stored by computer 14 (Figure
1) in storage medium 22 (Figure 1). This information is
30 electronically recorded on the magnetic media of the

[ABJAPAT.E19]

-12-

corresponding pre-purchased ticket.

In the preferred embodiment of the present invention, the ticket usage tracking system operates on a daily basis. Referring to Figure 2, each day a NEW TICKET file 32, ACTIVE
5 TICKET file 30, each DAILY TICKET USAGE file 36, TICKET USAGE SUMMARY file 38, and DAILY TICKET REFUND file 34 are created. At the end of each day, the information in each of these files is gathered and correlated by the central computer so as to produce NEXT DAY ACTIVE TICKET file 40,
10 EXCEPTION TICKET file 42, and TICKET HISTORY file 44.

Referring back to Figure 1, each day a NEW TICKET file is created and stored in central storage medium 22. First a number of pre-purchased tickets are encoded at operations control center 16. For each ticket to be generated by
15 ticket generator 24, the corresponding ticket type, date encoded, serial number and initial credit value are entered by an operator into computer 14 via terminal 20. Computer 14 generates corresponding electrical signals indicative of this data for storage in storage medium 22. During a given
20 day the tickets which have been created on that day are distributed to sales points throughout the transit system. A sale period is allowed for all tickets generated on that day to be sold completely to the patrons.

At the end of the sale period the tickets which were
25 created on that day but not sold are collected and the serial numbers of these unsold tickets are noted. These serial numbers are typically entered into computer 14 by an operator at terminal 20 in the same way as ticket refund entries are made. Computer 14 accesses NEXT DAY ACTIVE
30 TICKET file 40 in storage medium 22 and moves the

[ABJAPAT.E19]

information corresponding to the unsold tickets into the TICKET HISTORY FILE 44. Thus a complete record of tickets actually sold to the patrons is available. Again

5 referring to both Figure 1 and Figure 2, each day a new DAILY TICKET USAGE file 36a-36n and a DAILY TICKET USAGE SUMMARY file 38 are created. Each DAILY TICKET USAGE file contains information regarding the use of pre-purchased tickets throughout the day for each transportation system to which it corresponds.

10 Patrons possessing pre-purchased tickets access the transit system by presenting their pre-purchased tickets at automatic gates 10a through 10n. The automatic gates accept the pre-purchased tickets and allows the patron to enter the transit system. The automatic gates read from the ticket
15 information which is stored on the ticket magnetic medium. The automatic gates generate ticket information signals indicative of ticket information, namely ticket serial number, the remaining value on the ticket and the time the ticket was presented (fifteen minutes intervals). The
20 ticket information signals are passed on to station computer 12 via dedicated communications line 11. Station computer 12 receives these signals indicative of ticket information and adds information identifying the particular station. The station computer then generates a modified ticket
25 information signal indicative of the ticket information and station identification information. The station computer sends this signal via telephone line network 18 to operator control center 16. This information is continuously uploaded to operations control center 16 at night when the
30 operations control center computer system is accessible.

[ABJAPAT.E19]

Computer 14 receives this information, formats the information appropriately, and passes it to central storage medium 22 for storage in a corresponding system DAILY TICKET USAGE file 36a-36n.

- 5 Before automatic gate 10 returns the pre-purchased ticket to the patron the automatic gate generates a station identification signal indicative of the station in which it resides. The station identification information is recorded on the magnetic recording medium of the ticket being used.
- 10 The automatic gate then returns the ticket to the patron and the patron proceeds to his destination using the transit system.

- 15 When the patron reaches his destination he must again present his pre-purchased ticket at an automatic gate of the arrival station to exit the transit system. The automatic gate accepts the pre-purchased ticket and reads the ticket information and station origin information from the ticket magnetic recording medium. The automatic gate will capture the ticket when the value remaining on the ticket is
- 20 deducted to zero, i.e. credit has been depleted. The automatic gate then generates a ticket transaction signal indicative of this information, namely ticket serial number, the value remaining on the ticket, the time of use (fifteen minute increments), the value deducted for the trip just
- 25 taken, and information indicative of whether the ticket has been captured by the gate. The automatic gate sends the ticket transaction signal via communication line 11 to the station computer. The station computer receives the signal and adds to it information indicative of the station at
- 30 which it resides. The station computer then passes this

[ABJAPAT.E19]

-15-

modified ticket transaction signal via telephone communication network 18 to the operations control center 16 also typically at night.

At operations control center 16, computer 14 receives the signal and accesses the corresponding system DAILY TICKET USAGE file 36a-36n in storage medium 22 for the addition of this ticket usage information to the corresponding file. At this point each DAILY TICKET USAGE file 36a-36n contains information regarding the ticket transaction, that is, information indicating where and when a patron possessing the ticket used entered the transit system, where and when this patron exited the transit system, the value deducted from the ticket per usage, and whether this particular ticket was captured by the gate. In this manner, the ticket usage tracking system records all ticket usage or transaction information throughout the day in the DAILY TICKET USAGE files 36. At the end of the day the central computer access the DAILY TICKET USAGE files 36 for each transportation system using the tracking system and creates TICKET USAGE SUMMARY file 38. TICKET USAGE SUMMARY file 38 contains all the information contained in the individual DAILY TICKET USAGE files 36 from which a daily summary report may be generated.

Each day the DAILY TICKET REFUND information is entered by the operator into the ticket usage tracking system. Patrons may present pre-purchased tickets having value remaining on them for cash refund. The ticket serial number for each ticket accepted for cash refund is entered into the control operations center computer system by an operator through terminal 20. During the refund operation, the

[ABJAPAT.E19]

operator can review the remaining value of the ticket from the ticket usage tracking system by entering the ticket serial number through terminal 20 to determine the proper refund amount. Computer 14 then stores this information in

5 DAILY TICKET REFUND file 34 in storage medium 22.

Thus, at the end of each day an accurate NEW TICKET file 32, DAILY TICKET USAGE file 36, DAILY TICKET USAGE SUMMARY file 38, and DAILY TICKET REFUND file 34, for that particular day, are stored in storage medium 22. Overnight,

10 when the entire system experiences less demand, updating of files and report generation may be accomplished. In doing so, computer 14 accesses storage medium 22 and retrieves information from the NEW TICKET, DAILY TICKET USAGE, and

15 TICKET file to produce the NEXT DAY ACTIVE TICKET file, and update the EXCEPTION TICKET and TICKET HISTORY files.

NEXT DAY ACTIVE TICKET file 40 is created at the end of the current day by adding information from CURRENT DAY ACTIVE TICKET file 30 and DAILY NEW TICKET file 32;

20 removing from the created NEXT DAY ACTIVE TICKET file 40 information on tickets which have been refunded based upon information from DAILY TICKET REFUND 34; removing from the created NEXT DAY ACTIVE TICKET file 40 information on

25 information in the DAILY TICKET USAGE files 36; removing from the created NEXT DAY ACTIVE TICKET file 40 information on tickets which have expired based upon the ticket "date created" information from the NEXT DAY ACTIVE TICKET FILE

30 ACTIVE TICKET file 40 relative to remaining active tickets

[ABJAPAT.E19]

used that day based upon information from the DAILY TICKET USAGE files.

5 An accurate NEXT DAY ACTIVE TICKET file 40 allows transit system management to assess the total amount of credit remaining on all pre-purchased active tickets issued, and thus assess its outstanding economic liability for the beginning of the next day. It should be further noted that NEXT DAY ACTIVE TICKET file 40 becomes the CURRENT DAY ACTIVE TICKET file 36 used the next day. NEXT DAY ACTIVE
10 TICKET file 40 is also accessible to an operator via terminal 20, and therefore facilitates customer service when information on a particular pre-purchased ticket is desired. Furthermore, the information in NEXT DAY ACTIVE TICKET file 40 may be sorted by various categories to provide an output
15 thereof.

EXCEPTION TICKET file 42 contains information added thereto relative to tickets whose serial numbers are found in DAILY TICKET USAGE files 36, but not in CURRENT DAY ACTIVE TICKET file 30. EXCEPTION TICKET file 42 further
20 contains information relative to tickets which are found in the DAILY TICKET USAGE file 36 whose value in NEXT DAY ACTIVE TICKET file 40 is greater than the corresponding value in CURRENT DAY ACTIVE TICKET file 36, or the information of the ticket being used an excessive number of
25 times in the transit system. Generally the information in the EXCEPTION TICKET file 42 is a listing of tickets by ticket serial number. However, other data from DAILY TICKET USAGE files 36, CURRENT DAY ACTIVE TICKET file 30 and NEXT DAY ACTIVE TICKET file 40 may be included for each ticket in
30 EXCEPTION TICKET file 42. Such information may include

[ABJAPAT.E19]

beyond ticket serial number, information on station, date and time ticket last used; value of ticket, usage that day; and value over used.

5 The ticket information in EXCEPTION TICKET file 42 can then be investigated to identify fraudulent tickets, as well as the time, location and travel pattern of the fraudulent tickets. A "bad ticket" list, such as a list of the serial numbers of potentially fraudulent tickets, can then be entered into the operations control center computer system
10 by an operator via terminal 20. Computer 14 can generate signals indicative of the information in this "bad ticket" list and send it to the station computers 12 throughout the transit system via telephone line communication network 18. The station computers 12 can then communicate this
15 information to their respective automatic gates. The automatic gates are capable of capturing the tickets which bear serial numbers found on the "bad ticket" list and alert station security, if so instructed by the station computer. The ticket usage tracking system of the present invention
20 thus permits identification of fraudulent pre-purchased tickets so as to minimize future use thereof.

TICKET HISTORY file 44 is updated at the end of each day with the information available from CURRENT DAY ACTIVE
25 TICKET file 30, each DAILY TICKET USAGE file 36a-36n, and DAILY TICKET REFUND file 34. TICKET HISTORY file 44 contains information regarding captured, refunded, expired tickets and unsold tickets. Captured tickets are tickets whose credit have been completely depleted and have been captured by the automatic gates. Refunded tickets are
30 tickets which have been presented by patrons for a cash

[ABJAPAT.E19]

refund for the credit remaining on the ticket. Expired tickets are tickets which have been removed from CURRENT DAY ACTIVE TICKET file 30 after a specified amount of time has passed since their original issuance. Unsold tickets are
5 tickets which have been generated but not sold to the patron. TICKET HISTORY file 44 is available for access by an operator via terminal 20. Thus, customer queries concerning the status of their tickets can be accommodated. Furthermore, reports based upon data in this file may be
10 generated by various data categories.

At the end of each day, computer 14 accesses storage medium 22 for information in DAILY TICKET USAGE files 36a-36n. With this information the computer 14 generates TICKET
15 USAGE SUMMARY file 44 for storage of the information in the storage medium 22. TICKET USAGE SUMMARY file 44 contains all information regarding each usage or transaction involving a pre-purchased ticket on that day. The information in TICKET USAGE SUMMARY file 44 may be printed in hard copy form or displayed to allow transit system
20 management to accurately determine patron travel patterns. With knowledge of patron travel patterns the transit system can optimally assign vehicles and services in accordance with demand. Also, the information from the TICKET USAGE SUMMARY file 44 allows transit system management to
25 accurately distribute revenues among the plurality of separate but coordinated transportation systems which use the ticket usage tracking system.

It should be noted that reference is made to the creation of NEXT DAY ACTIVE TICKET file 40, EXCEPTION TICKET
30 file 42 and TICKET HISTORY file 44 at the end of the day.

Typically, the end of the business day is the preferred time for creating and updating of these files, and providing report outputs since a lesser processing demand on the computer 14 is made at this time from the transit system.

5 The processing action is thus typically performed overnight when processing time is more readily available and reports may be generated for use the next business day. However, it is to be understood that these processing functions can be performed at specified times other than the end of the day.

10 In summary, the method of the present invention provides for increased reliability of pre-purchased voucher fare collection systems. Also, the method of the present invention takes full advantage of a pre-purchased voucher fare collection system, providing system management with
15 access to extremely useful information.

The previous description of the preferred embodiment is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these
20 embodiments will be readily apparent to those skilled in the art, and the generic principals defined herein may applied to other embodiments without the use of the inventive facility. Thus, the present invention is not intended to be limited to the embodiment shown herein, but is to be
25 accorded the widest scope consistent with the principles and novel features enclosed herein.

CLAIMS

1. A method for providing certain information related
2 to the status of authorized vouchers used in a system where
3 vouchers are presented by patrons of said system in exchange
4 for services and/or goods, comprising the steps of:
 - 5 recording upon each respective authorized voucher
6 authorization information in the form of a unique
7 identification code and a corresponding initial credit
8 value; - 9 storing in a central storage medium for each
10 authorized voucher said voucher authorization information; - 11 issuing certain ones of said authorized vouchers
12 to patrons; - 13 generating, for each issued voucher involved in a
14 transaction, respective transaction information, said
15 transaction information indicative of the nature of each
16 transaction and a predetermined amount of credit to be
17 deducted according to each transaction; - 18 modifying, for each issued voucher involved in a
19 transaction, the corresponding credit value recorded
20 thereupon in accordance with said transaction information. - 21 storing in said central storage medium, for each
22 issued voucher involved in a transaction, corresponding
23 identification code and transaction information; - 24 providing from said central storage medium at a
25 predetermined time said stored voucher authorization
26 information and said stored issued voucher transaction
27 information; - 28 correlating said provided stored voucher

30 authorization information and issued voucher transaction
information by identification code; and

32 identifying ones of said authorized vouchers to
which a sum of all amounts to be deducted, for all
34 transactions related thereto, is less than the corresponding
voucher initial credit value.

2 2. The method of Claim 1 further comprising the step
of identifying unauthorized vouchers as those which a
voucher identification code associated therewith is
4 unmatched with any authorized voucher identification code.

2 3. The method of Claim 1 further comprising the step
of identifying other ones of said vouchers to which a sum of
all amounts to be deducted, for all transactions related
4 thereto, is greater than the corresponding voucher initial
credit value.

2 4. The method of Claim 1 further comprising the step
of deleting from said central storage medium said voucher
authorization information corresponding to certain other
4 ones of said authorized vouchers that are unissued to
patrons.

2 5. The method of Claim 1 further comprising the step
of generating for each issued voucher, to which a refund of
said voucher corresponding credit value is made to a patron,
4 a refund indication.

6. In a mass transit system having an automated fare

[ABJAPAT.E19]

2 collection system in which vouchers are used by patrons of
said transit system in exchange for services and/or goods,
4 wherein relative to each voucher to be authorized for use in
the transit system voucher authorization information in the
6 form of a unique identification information and/or a credit
value is generated and recorded on each respective voucher,
8 and upon each use of a voucher in said transit system said
fare collection system generates transaction information
10 indicative of the nature of the transaction and a debit to
the corresponding voucher credit value with said debited
12 credit value recorded on said corresponding voucher as a
current credit value, said fare collection system stores in
14 a storage medium at the end of a time period information on
authorized vouchers to which the current credit value is
16 greater than zero, the authorized voucher identification
information and corresponding current credit value as
18 current active voucher information, a method for tracking
voucher usage during a next time period, comprising the
20 steps of:

receiving said voucher authorization information
22 generated during said next time period;

receiving said transaction information
24 corresponding to voucher usage during said next time period;
correlating at said next time period end said next
26 time period voucher authorization information and
transaction information with said stored current active
28 voucher information;

identifying at said next time period end each of
30 said authorized vouchers, from said correlated voucher
authorization, transaction and current active voucher

32 information, to which a sum of debits according to
34 transactions corresponding to each respective voucher
during said next time period is less than said authorized
voucher stored current credit value; and

36 updating, for each identified authorized voucher
identified, at said next time period end said current active
38 voucher information as new current active voucher
information with said new current active voucher
40 information having said identified voucher identification
information and new current credit value reflecting said sum
42 of debits.

7. The method of Claim 6 further comprising the step
2 of storing said new current active voucher information in
said storage medium for usage as said current active voucher
4 information in a time period following said next time
period.

8. The method of Claim 6 further comprising the step
2 of identifying unauthorized vouchers as those to which said
voucher identification code associated therewith is
4 unmatched with any authorized voucher identification code.

9. The method of Claim 6 further comprising the step
2 of identifying other ones of said vouchers as those to which
a sum of all amounts to be deducted, for all transactions
4 related thereto, is greater than the corresponding voucher
initial credit value.

10. The method of Claim 6 further comprising the step
2 of deleting from said identified authorized voucher
information, authorized voucher information corresponding to
4 vouchers which are unissued to patrons during said next time
period.

11. The method of Claim 6 further comprising the step
2 of deleting from said new current active voucher
information, authorized voucher information corresponding
4 to vouchers issued to patrons during a predetermining
previous time period.

12. The method of Claim 10 further comprising the step
2 of deleting from said new current active voucher
information, authorized voucher information corresponding to
4 vouchers issued by patrons during a predetermining previous
time period.

13. The method of Claim 11 further comprising the step
2 of storing in said storage medium said deleted information
as voucher history information.

14. The method of Claim 13 wherein said vouchers
2 having a credit value equal to zero are vouchers to which a
refund is made to a patron.

15. The method of Claim 13 wherein said vouchers
2 having a credit value equal to zero are vouchers to which a
credit value is extinguished based upon debits due to use.

[ABJAPAT.E19]

16. The method of Claim 6 further comprising the steps
2 of identify and storing in said storage medium authorized
voucher information corresponding to vouchers in which said
4 the sum of debits exceed said current credit value.

17. The method of Claim 6 further comprising the
2 steps of identifying and storing in said storage medium
authorized voucher information corresponding to vouchers in
4 which said transaction information indicates usage of said
corresponding voucher during said next time period and said
6 corresponding voucher is nonexistent in said current active
voucher information.

18. A system for providing certain information related
2 to the status of vouchers used in said system by system
patrons in exchange for goods and/or services, comprising:

4 voucher generator means for, generating voucher
authorization information in the form of a unique
6 identification code and corresponding initial credit value
for each voucher and recording said authorization
8 information upon a respective voucher;

processing means coupled to said voucher generator
10 means for receiving and storing said authorization
information;

12 transaction means for generating transaction
information and corresponding signals indicative of each
14 transaction involving an exchange of goods and/or services
for a debit against each corresponding voucher credit value,
16 for generating credit debit information and corresponding

[ABJAPAT.E19]

18 signals indicative of an amount of credit to be deducted
from the credit value of each voucher involved in a
transaction, and for recording upon said corresponding
20 voucher a credit debit, said transaction means providing an
output of said transaction and credit debit signals along
22 with each voucher identification code to said processing
means at a predetermined time; and wherein

24 said processing means further receives said transaction
and credit debit signals for, correlating said transaction
26 and credit information with said authorization information,
identifying according to identification codes ones of said
28 vouchers to which a respective voucher sum of credit debits
is less than at initial credit value and providing a
30 corresponding time voucher output indication.

19. The system of Claim 19 wherein said processing
2 means is further for identifying according to identification
codes ones of said vouchers as unauthorized vouchers which
4 are involved in a transaction and having an identification
code unmatched with voucher authorization information and
6 providing a corresponding unauthorized voucher output
indication.

20. The system of Claim 18 wherein said processing
2 means is further for identifying according to identification
codes ones of said vouchers to which a respective voucher
4 sum of credit debits is greater than its initial credit
value and providing a corresponding expended voucher output
6 indication.

[ABJAPAT.E19]